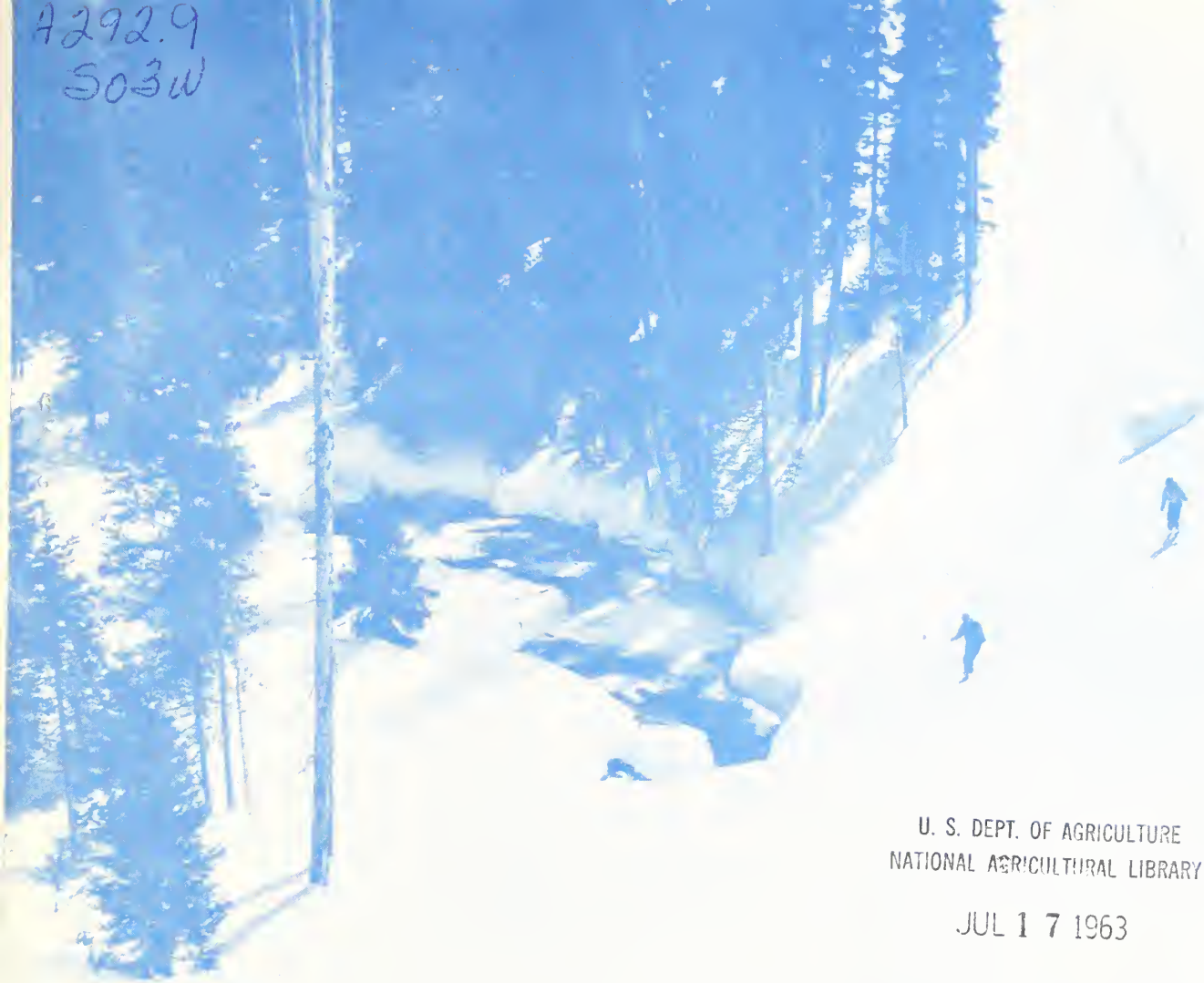


WATER SUPPLY OUTLOOK
and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS
for
WESTERN UNITED STATES
Including Columbia River Drainage in Canada

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE
Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
FEB. 1, 1963

UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

To Recipients of Water Supply Outlook Reports:

The climate of the cultivated and populated areas of the West is characterized by relatively dry summer months. Such precipitation as occurs falls mostly in the winter and early spring months when it is of little immediate benefit to growing crops. Most of this precipitation falls as mountain snow which stays on the ground for months, melting later to sustain streamflow during the period of greatest demand during late spring and summer. Thus, nature provides in mountain snow an imposing water storage facility.

The amount of water stored in mountain snow varies from place to place as well as from year to year and accordingly, so does the runoff of the streams. The best seasonal management of variable western water supplies results from advance estimates of the streamflow.

A snow survey consists of a series of about ten samples taken with specially designed snow sampling equipment along a permanently marked line, up to 1000 feet in length, called a snow course. The use of snow sampling equipment provides snow depth and water equivalent values for each sampling point. The average of these values is reported as the snow survey measurement for a snow course.

Snow surveys are made monthly or semi-monthly beginning in January or February and continue through the snow season until April, May or June. Currently more than 1400 western snow courses are measured each year. These measurements furnish the key data for water supply forecasts.

Streamflow forecasts are obtained by a comparison of total or maximum snow accumulation, as measured by snow water equivalent, to the subsequent spring and summer or snowmelt season runoff over a period of years. The snow water equivalent measured in selected snow courses provides most of the index to the streamflow forecast for the following season. More accurate forecasts are usually obtained when other factors such as soil moisture, base flow and spring precipitation are considered and included in the forecast procedure. Early season forecasts assume average climatic conditions through the snowmelt season.

Listed below are the Federal-State-Private Cooperative Snow Survey and Water Supply Forecast reports available for the West which contain detailed information on snow survey measurements, streamflow forecasts, reservoir storage, soil moisture and other guide data to water management and conservation decisions. Soil Conservation Service Reports may be secured from Water Supply Forecasting Unit, Soil Conservation Service, P.O. Box 4170, Portland 8, Oregon.

PUBLISHED BY SOIL CONSERVATION SERVICE

REPORTS	ISSUED	LOCATION	COOPERATING WITH
RIVER BASINS			
WESTERN UNITED STATES	MONTHLY (FEB.-MAY)	PORTLAND, OREGON	ALL COOPERATORS
STATES			
ALASKA	MONTHLY (MAR.-MAY)	PALMER, ALASKA	ALASKA S.C.D.
ARIZONA	SEMI-MONTHLY (JAN.15 - APR.1)	PHOENIX, ARIZONA	SALT R. VALLEY WATER USERS ASSOC. ARIZ. AGR. EXP. STATION
COLORADO AND NEW MEXICO	MONTHLY (FEB.-MAY)	FORT COLLINS, COLORADO	COLO. STATE UNIVERSITY COLO. STATE ENGINEER N. MEX. STATE ENGINEER
IDAHO	MONTHLY (JAN.-JUNE)	BOISE, IDAHO	IDAHO STATE RECLAMATION ENGINEER
MONTANA	MONTHLY (JAN.-JUNE)	BOZEMAN, MONTANA	MONT. AGR. EXP. STATION
NEVADA	MONTHLY (JAN.-MAY)	RENO, NEVADA	NEVADA DEPT. OF CONSERVATION AND NATURAL RESOURCES - DIVISION OF WATER RESOURCES
OREGON	MONTHLY (JAN.-JUNE)	PORTLAND, OREGON	OREG. STATE UNIVERSITY OREGON STATE ENGINEER
UTAH	MONTHLY (JAN.-JUNE)	SALT LAKE CITY, UTAH	UTAH STATE ENGINEER
WASHINGTON	MONTHLY (FEB.-JUNE)	SPOKANE, WASHINGTON	WN. STATE DEPT. OF CONSERVATION
WYOMING	MONTHLY (FEB.-JUNE)	CASPER, WYOMING	WYOMING STATE ENGINEER

PUBLISHED BY OTHER AGENCIES

REPORTS	ISSUED	AGENCY
BRITISH COLUMBIA	MONTHLY (FEB.-JUNE)	WATER RIGHTS BR., DEPT. OF LANDS, FORESTS AND NATURAL RESOURCES, PARLIAMENT BLDG., VICTORIA, B.C., CANADA
CALIFORNIA	MONTHLY (FEB.-MAY)	CALIF. DEPT. OF WATER RESOURCES, P.O. BOX 388, SACRAMENTO, CALIF.

USDA-SCS PORTLAND, OREG. 962

WATER SUPPLY OUTLOOK
and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS
for
WESTERN UNITED STATES
Including Columbia River Drainage in Canada

ISSUED

FEBRUARY 8, 1963

The Soil Conservation Service coordinates Snow Surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Geological Surveys, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

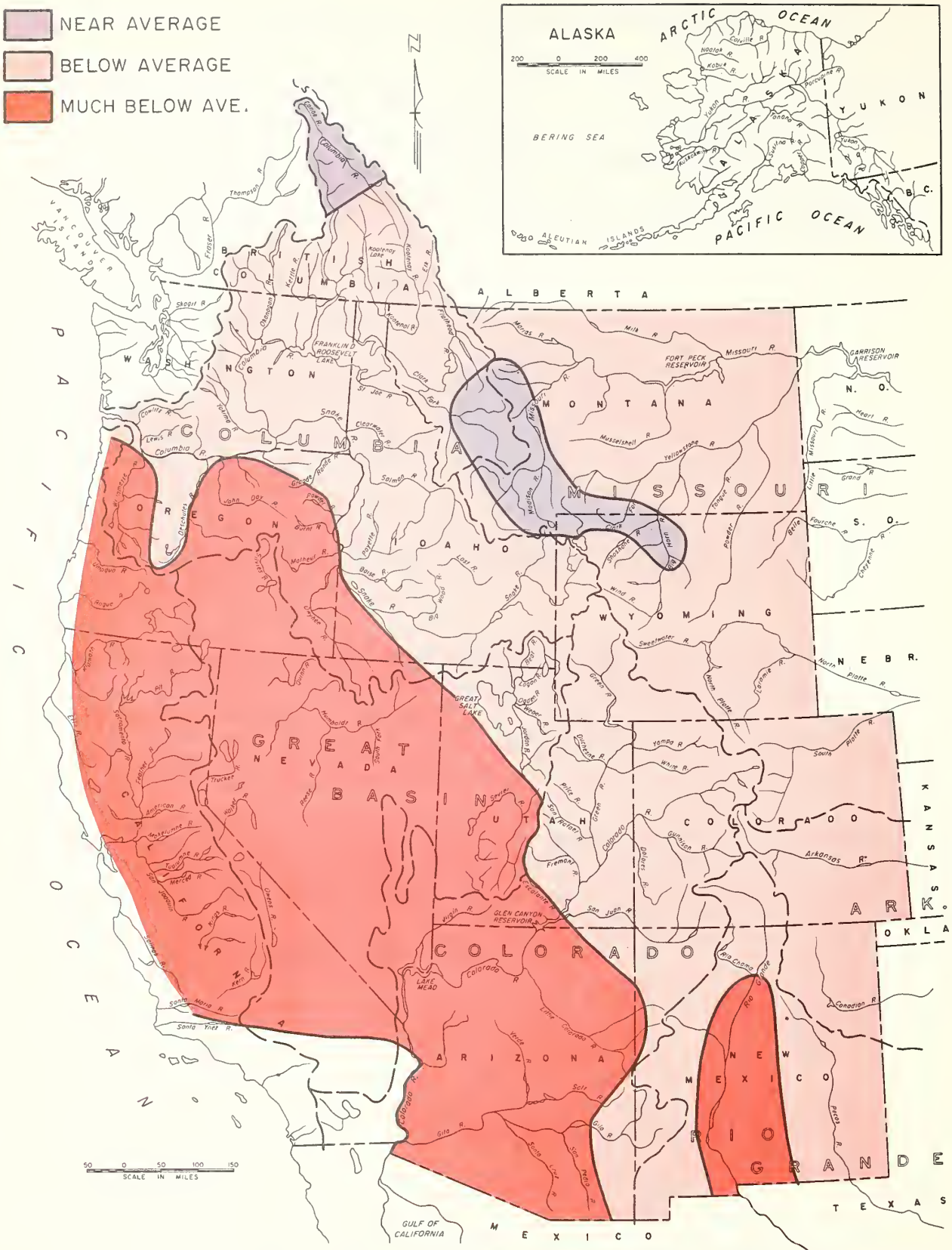
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report is prepared under the direction of R. A. Work, Head, Water Supply Forecasting Unit, Soil Conservation Service, Portland, Oregon, from data and reports supplied by Snow Survey Supervisors of the Soil Conservation Service: Arizona, Richard W. Enz; Colorado and New Mexico, Jack N. Washichek; Idaho, M. W. Nelson; Montana, Phil E. Farnes; Nevada, Manes Barton; Oregon, W. T. Frost; Utah, Gregory L. Pearson; Washington, Robert T. Davis; Wyoming, George W. Peak.

California....Dept. of Water Resources, Robert W. Miller, Chief, Water Supply Forecast and Snow Surveys Unit.

British Columbia.....Dept. of Lands, Forests, and Water Resources, Harry I. Hunter, Meteorologist, Water Rights Branch.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
D.A. Williams, Administrator



April - September
PROSPECTIVE STREAMFLOW
AS OF FEBRUARY 1, 1963

WATER SUPPLY OUTLOOK

As of February 1, 1963

MOUNTAIN SNOW PACK IS SHORT IN WESTERN STATES AS OF MID-WINTER, WITH GREATEST DEFICIENCY IN WESTCOAST STATES. WATER SUPPLIES WILL BE MUCH LESS THAN FOR 1962, BUT OUTLOOK IS GENERALLY BETTER THAN FOR 1961 WEST OF CONTINENTAL DIVIDE. SEVERE SHORTAGES ARE MOST LIKELY IN NEVADA, WESTERN UTAH AND SOUTHERN OREGON AND IDAHO IN AREAS WITHOUT RESERVOIRS.

With nearly half of the 1962-1963 snow accumulation season passed, the water supply outlook for western irrigated areas is fair to poor. Mountain snow accumulation to date ranges from 60 to 80 percent of average along the Continental Divide from Montana to northern New Mexico. Soil moisture under the snow in this general area is near or below average. Streamflow forecasts for the snowmelt period in 1963 follow the same percentage of average as mountain snowpack.

For the west coast states, in the Cascades of Washington and Oregon and the Sierras of California, the mountain snowpack is far short of average. Precipitation during the fall and early winter months has totaled near average from central Washington to the San Joaquin Valley. Temperature and storm sequences have provided very little permanent snow except at the highest elevations. Much of the precipitation has fallen as rain and such as has fallen as snow has melted from subsequent warm temperatures or rainfall. Snow water equivalent measurements of 20 to 30 percent of average for February 1 are common. Rainstorms occurring the last few days of January melted and washed away the limited snow accumulation. This resulted in floods and flood threats in parts of California, Nevada, Oregon, and Idaho.

The flood waters increased irrigation reservoir storage to above average in many areas where adequate storage was available. If snowfall from now through the spring months follows the pattern of early winter, stored water will furnish a large segment of total available water supplies in 1963 for Nevada, the large Central Valley of California and adjacent areas of Oregon, Utah and southwestern Idaho. A reasonably adequate water supply is in prospect for the Salt and Gila rivers in Arizona because of good carryover storage.

The same storm that brought heavy rains and fast melting snow to western states improved the water supply outlook for intervening mountain streams in northern and eastern Idaho, including the Snake River and its northern tributaries, and northern and central Utah. This one storm raised the water supply outlook from an impending drouth up to where 60 to 80 percent of an average water supply may be expected. Southern tributaries to the Snake, the Humboldt of Nevada, the Sevier Basin in Utah, and the Mogollon Rim area of Arizona did not share in the benefits of this general storm.

In summary, water supplies will be much less adequate than in the relatively plentiful year of 1962. However, the outlook is much better than for the drouth year of 1961. Most severe shortages will occur on streams with inadequate storage. As of this date shortages are forecast to be most prevalent in Nevada, central and southern Oregon, areas of Idaho south of the Snake River, and the Sevier Basin and adjacent streams of southwestern Utah.

MISSOURI BASIN

Snow cover on the headwaters of the Missouri River and most of its tributaries is well below average. Near average snowpack for February 1 exists on the headwaters of the Gallatin and Bridger mountains in Montana and the Bighorn Mountains of north central Wyoming. Minimum snowpack of about 60 percent of average has accumulated on the Platte River watershed in Colorado and Wyoming. Reservoir storage is available to supplement the expected less than normal streamflows for the principal irrigated areas.

MONTANA

Irrigation water supplies for 1963 can now be reasonably assured only along the large streams, the Yellowstone, the Missouri and its tributaries above Three Forks. However, except for the Gallatin, seasonal snowpack is much less than average. If subsequent snowfall is deficient, there could be late season shortages in tributary irrigated areas. The most likely areas of shortage are on smaller tributaries well to the east of the Continental Divide and along the Sun, Marias, Teton, and Milk rivers. Soil moisture in mountain areas is near average except for the northern section of the watershed.

WYOMING

Mountain snowpack on the headwaters of the Wind and Shoshone rivers is deficient. The outlook is for below normal streamflow. Deficiencies in water supply in late season are in prospect for Wind River tributaries

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS FEBRUARY 1, 1963

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	71	72
Madison	53	62
Gallatin	69	94
Missouri Main Stem	76	76
Yellowstone	61	68
Shoshone	70	67
Wind	53	59
North Platte	53	59
South Platte	44	62
ARKANSAS BASIN		
Arkansas	46	68
Canadian	88	80
RIO GRANDE BASIN		
Rio Grande (Colo.)	54	66
Rio Grande above Otowi Bridge	73	79
Pecos	76	133
COLORADO BASIN		
Green (Wyo.)	54	78
Yampa - White	42	58
Duchesne	58	67
Price	59	71
Upper Colorado	45	58
Gunnison	46	66
San Juan	60	61
Dolores	45	47
Virgin	11	11
Gila	31	71
Salt	34	62
GREAT BASIN		
Bear	61	71
Logan	60	74
Ogden	53	72
Weber	56	61
Provo - Utah Lake	55	59
Jordan	37	38
Sevier	38	41
Walker - Carson	18	12
Tahoe - Truckee	21	13
Humboldt	8	7
Lake Co. (Oregon)	3	3
Harney Basin (Oregon)	28	27
UPPER COLUMBIA BASIN		
Columbia (Canada)	71	90
Kootenai	55	47
Clark Fork	74	79
Bitterroot	60	58
Flathead	56	59
Spokane	57	64
Okanogan	43	46
Methow	90	69
Chelan	77	69
Wenatchee	37	38

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	54	57
Snake above Hiese, Idaho	55	60
Snake above American Falls Res	56	63
Henry's Fork	53	65
Southern Idaho Tributaries	41	45
Big and Little Wood	83	70
Boise	61	56
Owyhee	10	9
Payette	66	62
Malheur	37	31
Weiser	49	50
Burnt	39	36
Powder	44	41
Salmon	69	70
Grande Ronde	36	34
Clearwater	56	66
LOWER COLUMBIA BASIN		
Yakima	50	40
Umatilla	35	31
John Day	28	29
Deschutes - Crooked	23	22
Hood	36	28
Willamette	22	19
Lewis	53	45
Cowlitz	58	49
PACIFIC COASTAL BASIN		
Puget Sound	59	52
Olympic Peninsula	74	50
Umpqua - Rogue	26	24
Klamath	22	20
Trinity		
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento		
Feather		
Yuba		
American		
Mokelumne		
Stanislaus		
Tuolumne		
Merced		
San Joaquin		
Kings		
Kaweah		
Tule		
Kern		

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1943-57 period.

Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

above Riverton and the smaller tributaries of the Bighorn through the Powell Basin. The flow of the Shoshone, along with storage, should be adequate. If snowfall continues at an average rate, irrigated areas on each side of the Bighorn Mountains may expect an average water supply. Storage is small, which may cause shortages in late season.

With carryover storage at near average levels on the North Platte, the combination of storage and the below average inflow to Seminoe should meet normal demands along the main stem. Unless the rate of snowfall increases, shortages of water in late season will probably occur on the Laramie and on North Platte tributaries above Saratoga.

COLORADO

The indicated flow of South Platte tributaries is slightly over half of average, but the water supply outlook is fair to good. Storage in smaller irrigation reservoirs in the upper irrigated areas is above average. Storage along the lower South Platte is well in excess of average and near capacity. The resources of the Colorado-Big Thompson project will be fully available to supplement the prospective shortage of streamflow. Municipal reservoir storage is in good condition.

ARKANSAS BASIN

The outlook for irrigation along the Arkansas and its tributaries in Colorado and western Kansas is not favorable as of this time. Streamflows are expected to range from 50 to 70 percent of average. Storage in smaller irrigation reservoirs is deficient, and practically no water is stored in John Martin.

Although the flow of the Canadian River in New Mexico from snowmelt will probably be less than average, storage in Conchas Reservoir is above average and comparable to a year ago.

RIO GRANDE BASIN

A limited water supply is again in prospect for the San Luis Valley of Colorado for 1963. Snow cover on the Continental Divide Range is about 60 percent of average. Unless spring precipitation exceeds average, an extensive use of groundwater will again be necessary.

Seasonal snowfall has been somewhat greater in northern New Mexico than in southern Colorado. The flow of the Rio Grande at Otowi Bridge for the Middle Rio Grande District is expected to be less than the 1943-57 average and similar to the past two or three years. For the Lower Rio Grande, inflow to Elephant Butte will be much less than average and typical of recent years. Storage in Elephant Butte is below average, slightly more than for a year ago.

Total surface water supplies will continue to be less than demands.

The flow of the Pecos River will be near average. Storage in Alamogordo and other reservoirs is relatively good but not at capacity as it was in 1962.

COLORADO BASIN

The seasonal snowpack to date is substantially less than average over the entire basin, 60 to 70 percent of average for the principal water contributing snow areas to the main river. The range is from a low of 11 percent of average on the Virgin River in southwestern Utah to 79 percent for the Green River of Wyoming. Inflow to Lake Mead is expected to be about 60 percent of average.

Upper Basin

COLORADO - WYOMING - NEW MEXICO

Forecasts of flow of the Green River and Colorado River tributaries in Wyoming and Colorado range near three-quarters of normal. Water supplies should be reasonably adequate throughout the season on the Yampa, White, Upper Colorado, Gunnison, San Juan, Animas, and their tributaries. Some smaller streams, including the North Fork of the Gunnison, Dolores, Florida, and La Plata, may have late season shortages.

UTAH

The water supply outlook for Colorado River tributaries in Utah is fair as a result of recent storms. Snow cover is still short on the mountain watersheds of central Utah. Adequacy of water supplies will be contingent on average or better snowfall for the remainder of the season. Reservoir storage is still considerably below average. Total water supply will be much less than last year, but the outlook for another severe drouth year such as 1961 has been, temporarily at least, reversed for all streams except for the Virgin River.

ARIZONA

The 1963 water supply outlook for Arizona is near average on the major irrigation projects. Runoff from snowmelt is expected to be low, but carryover storage from last year will make up much of this deficiency.

Snow cover has generally dropped during the past month and is now near a minimum of record except for the headwaters of the Gila River on the Arizona-New Mexico border. The Gila snowpack is about 80 percent of average for February 1. Soil moisture under the snowpack is relatively good on the Gila, near average in other mountain areas, and dry on the plateau area of the north central section of the state.

Streamflow forecasts as of this date for the spring months range near one-half of average for the Little Colorado, Salt, and Verde rivers up to average for the Upper Gila and San Francisco. Forecasts are subject to considerable adjustment depending on precipitation during February and March.

SELECTED STREAMFLOW FORECASTS FEBRUARY 1, 1963

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1962	FORECAST 1963	
UPPER MISSOURI			
Clark Fork at Chance, Montana			
Gallatin near Gateway, Montana			
Jefferson at Sappington, Montana			
Madison near Grayling, Montana 1/			
Missouri near Zortman, Montana 2/			
Missouri near Williston, N. Dakota 3/			
Yellowstone at Corwin Springs, Montana			
Yellowstone at Miles City, Montana			
Shoshone below Buffalo Bill Res., Wyoming 4/		640	76
Wind at Dubois, Wyoming		76	69
PLATTE			
Clear at Golden, Colorado 5/		96	70
North Platte at Saratoga, Wyoming		430	65
Cache LaPoudre near Ft. Collins, Colorado 6/		123	65
ARKANSAS			
Arkansas at Salida, Colorado 7/		245	72
RIO GRANDE			
Rio Grande near Del Norte, Colorado 8/		290	59
Rio Grande at Otowi Bridge, New Mexico 9/		280	44
Pecos at Pecos, New Mexico *		40	80
UPPER COLORADO			
Animas at Durango, Colorado		400	84
Colorado at Glenwood Springs, Colorado 10/		1100	71
Colorado near Cisco, Utah		2900	71
Colorado near Grand Canyon, Arizona 11/		5550	61
Duchesne near Tabiona, Utah 12/		65	52
Green near Greendale, Utah 13/		840	57
Green near Green River, Utah 13/		1700	71
Gunnison near Grand Junction, Colorado		1100	79
Price near Scofield, Utah 14/		32	80
San Juan near Bluff, Utah 15/		850	69
White at Meeker, Colorado		200	60
Yampa at Steamboat Springs, Colorado		175	62
LOWER COLORADO			
Gila at Virden, Arizona (Jan.-May)	145	56	115
Salt at Intake, Arizona (Jan.-May)	607	175	63
Verde above Horseshoe Dam, Arizona (Jan.-May)	250	84	44
GREAT BASIN			
Bear at Harer, Idaho 16/		165	55
Logan near Logan, Utah 17/	140	112	78
Ogden, Inflow to Pine View Res., Utah 18/ (Mar.-July)	142	116	83
Provo at Vivian Park, Utah 19/		118	74
Sevier at Hatch, Utah 20/		22	45
Sevier near Kingston, Utah		6	20
Humboldt at Palisades, Nevada **	267	40	18
Truckee at Farad, California ** 21/			
West Walker near Coleville, California **	155	65	44

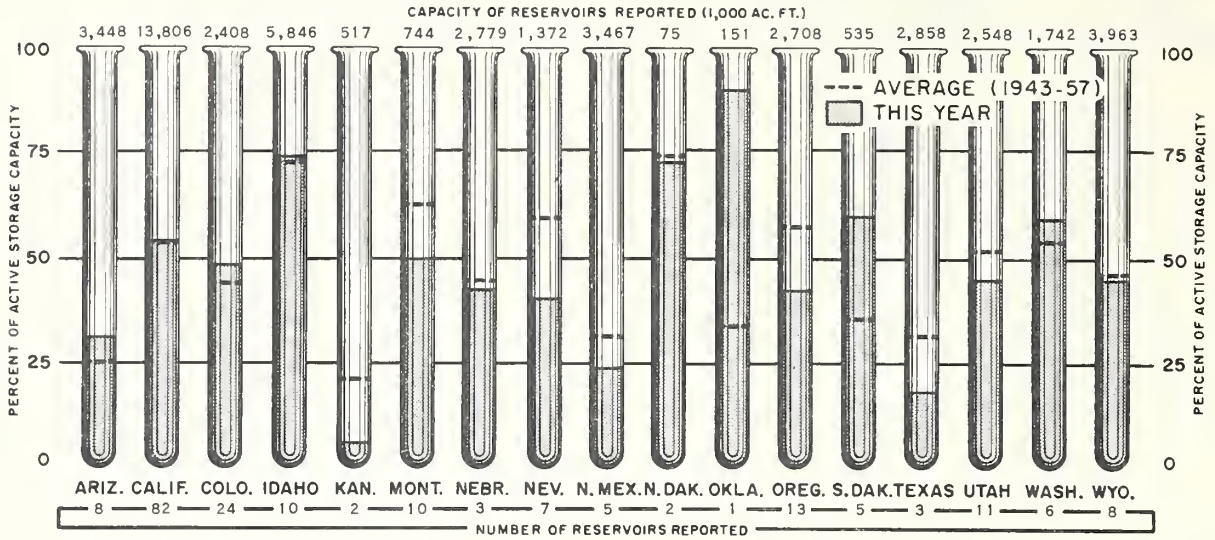
Forecasts in California provided by Department of Water Resources.
Average is for 1943-57 period except California. California is computed for 1908-57 period.
Forecasts assume average Effective Climatic Conditions from Date Through Snow Melt Season.

SELECTED STREAMFLOW FORECASTS FEBRUARY 1, 1963

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW 1962	FORECAST 1963	
UPPER COLUMBIA			
Bitterroot near Darby, Montana			
Chelan at Chelan, Washington 22/			
Clark Fork above Missoula, Montana			
Clark Fork at Whitehorse Rapids, Montana 23/			
Columbia at Revelstoke, British Columbia			
Columbia at Birchbank, British Columbia 24/	41300		
Columbia at Grand Coulee, Washington 24/	62300		
Columbia at The Dalles, Oregon 24/	92700	84500	80
Flathead near Polson, Montana 23/	7040		
Kootenai at Wardner, British Columbia	4150		
Kootenai at Leonia, Idaho	7590		
Okanogan near Tonasket, Washington			
Spokane at Post Falls, Idaho 25/	3050	2500	77
SNAKE			
Big Lost, Inflow to Mackay Res., Idaho 26/		103	60
Big Wood, Inflow to Magic Res., Idaho 27/ (Mar.-July)		192	62
Boise above Diversion Dam, Idaho 28/		1160	67
Clearwater at Spalding, Idaho	8370	7000	77
Malheur near Drewsey, Oregon		35	43
Owyhee Res. Net Inflow, Oregon 18/	340	100	23
Payette near Horseshoe Bend, Idaho 29/		1450	72
Salmon at Whitebird, Idaho	6180	5400	76
Snake near Heise, Idaho 30/	4260	2900	70
Snake at Weiser, Idaho	5190		
LOWER COLUMBIA			
Cowlitz at Castle Rock, Washington			
Deschutes at Benham Falls, Oregon 31/		400	66
Grande Ronde near LaGrande, Oregon		100	50
Hood near Hood River, Oregon 32/		250	68
Willamette at Salem, Oregon 33/		3800	70
Yakima near Parker, Washington 34/			
NORTH PACIFIC COASTAL			
Dungeness near Sequin, Washington			
Rogue at Raygold near Central Point, Oregon		675	67
Klamath Lake, Net Inflow, Oregon 35/	447	375	59
CALIFORNIA CENTRAL VALLEY 36/**			
American, Inflow to Folsom Res., Calif.		690	50
Feather near Oroville, Calif.		1020	51
Kaweah near Three Rivers, Calif. 37/		150	56
Kern near Bakersfield, Calif.		250	56
Kings, Inflow to Pine Flat Res., Calif.		760	64
Merced, Inflow to Exchequer Res., Calif.		330	53
Mokelumne, Inflow to Pardee Res., Calif.		265	55
Sacramento, Inflow to Shasta Res., Calif.		1400	77
San Joaquin, Inflow to Friant Res., Calif.		740	60
Stanislaus, Inflow to Melones Res., Calif.		440	59
Tule, Inflow to Success Res., Calif.		20	34
Tuolumne, Inflow to Don Pedro Res., Calif.		700	57
Yuba at Smartville, Calif.		530	47

Explanatory Notes on Forecasts Listed on Inside Back Cover.
** April - June Period ** April - July Period*

RESERVOIR STORAGE as of February 1



GREAT BASIN

UTAH

Water supply outlook for the Great Basin area of northern and central Utah has improved materially in the past few days. Mountain snowpack has improved from near a minimum of record to near three-quarters of average for February 1 on the Bear, Logan, and Weber rivers. Streamflow in this area will be less than normal, and total water supply outlook is fair. A relatively poor outlook is in prospect for water users in Utah County and those in the Salt Lake City area served by Utah Lake. The storage in Utah Lake did not return to normal carryover levels in 1962. Streamflow forecasts are 50 to 60 percent of average. Most severe shortages are expected on the Sevier and Beaver rivers in southwestern Utah. Forecasts are generally less than one-half of average. Reservoir storage is critically low on these streams.

NEVADA

In the western section of the Great Basin the outlook for the summer months is for drouth at a time when damaging floods have just subsided. The heavy rains and warm temperatures of the past few days have removed what was a very short snowpack from mountain areas. Snowpack is now almost nonexistent on both the eastern slope of the Sierras as well as on the Ruby Mountains in eastern Nevada and other water source areas for the Humboldt River.

The recent high flows improved reservoir storage to above average except for Lake Tahoe. Unless the rate of snowfall for the remainder of the season increases, this storage will be the principal source of water for next year's irrigation needs.

Storage in Lake Tahoe is still far below average since the lake level was gradually reduced during the 1959-61 drouth period and could not fully recover in 1962. With the present outlook, it appears that the lake will reach minimum levels again in 1963.

OREGON

Mountain snowpack is at a minimum of record for the Great Basin area of south central Oregon. Storage is very limited. The only favorable item in water supply is good soil moisture conditions. The outlook for this area is poor.

COLUMBIA BASIN

Snowfall to February 1 continues to be deficient in the Columbia Basin, especially in the Cascades of western Washington and Oregon. Only the Big Bend area of British Columbia has a near average snowpack as of this date. The flow of the Columbia at The Dalles for the April-September 1963 period is forecast at 84,500,000 acre-feet, or 80 percent of average.

BRITISH COLUMBIA

The Water Resources Service of the Province of British Columbia reports that seasonal snowfall has been near average in the northern section of the Columbia Basin and substantially less than average in the southern portion of British Columbia. Summer flow of the main stem of the Columbia in Canada should be near average, but flows of the Kootenay and Okanogan are expected to be considerably less than average.

MONTANA

Streamflow will be below average for the Clark Fork and Kootenai rivers in and through Montana. Snowpack is up to near 80 percent of average for the Clark Fork but near 60 percent on the Kootenai and Bitterroot. Storage in power reservoirs is near average. This deficiency in water supply outlook is not ex-

STORAGE IN LARGE RESERVOIRS FEBRUARY 1, 1963

BASIN AND NAME OF RESERVOIR	CAPACITY (1000A.F.)	STORAGE (1000A.F.)
UPPER MISSOURI		
Boysen	560	340
Buffalo Bill	380	175
Canyon Ferry	2043	1951
Hebgen	385	234
Tiber	1316	628
Belle Fourche	185	141
Keyhole	190	60
Fort Peck	19410	9876
Fort Randall	6100	2818
Garrison	24500	12582
Oahe	23600	9555
PLATTE		
Glendo	786	325
Pathfinder	1011	541
Seminoe	982	311
Colo-Big Thompson (4)	865	585
City of Denver (4)	218	168
ARKANSAS		
Conchas	600	290
John Martin	367	12
RIO GRANDE		
Elephant Butte	2207	426
El Vado	194	2
UPPER COLORADO		
Flaming Gorge	3789	54
Navajo	1709	76
Powell	28000	36
LOWER COLORADO		
Havusu	619	538
Mead	27207	22676
Mohave	1810	1682
San Carlos	1206	73
Salt River Res. (4)	1755	984
Verde River Res. (2)	322	21
GREAT BASIN		
Bear	1421	721
Lahontan	286	193
Rye Patch	179	75
Sevier Bridge	236	44
Strawberry	270	48
Tahoe	732	175
Utah	1149	244

BASIN AND NAME OF RESERVOIR	CAPACITY (1000A.F.)	STORAGE (1000A.F.)
UPPER COLUMBIA		
Chelan	676	371
Coeur d'Alene	889	93
Flathead	1791	1399
Hungry Horse	3428	2775
Kootenay	673	601
Pend Oreille	1155	1157
Roosevelt	5232	3345
LOWER COLUMBIA		
Detroit	300	1
Hills Creek	249	1
Lookout Point	337	1
Yakima Res. (5)	1065	716
SNAKE		
American Falls	1700	1175
Arrowrock	287	248
Anderson Ranch	423	282
Brownlee	1427	1148
Cascade	653	511
Jackson	847	551
Lucky Peak	278	121
Palisades	1202	909
Owyhee	715	226
PACIFIC COASTAL		
Clear Lake	440	112
Upper Klamath	584	352
Ross	1203	1143
Trinity	2500	1892
CALIFORNIA CENTRAL VALLEY		
Almanor	650	320
Berryessa	1600	1348
Cachuma	206	184
Casitas	248	47
Cherry Valley	268	80
Don Pedro	260	144
Folsom	1010	612
Hetch-Hetchy	360	117
Isabella	552	98
McClure	281	84
Millerton	503	271
Nacimiento	350	49
Pardee	210	199
Pine Flat	1001	346
Shasta	4500	3192
Twitchell	250	2

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

pected to result in irrigation water shortage except for late season along the Bitterroot.

IDAHO

Snow cover is deficient on the headwaters of the Snake River and its tributaries throughout the state but much improved over that of mid-January. With near or above average reservoir storage, water supplies should be adequate along the Snake, Boise, and Payette rivers. Irrigated areas on the Wood and Lost rivers in central Idaho may experience some shortage unless the mountain snowpack increases substantially in relation to average during February and March. From the Bear River Basin west through southern Idaho, water shortages will be severe unless the snowfall situation improves markedly during the late winter and spring months.

Forecasts for the Salmon, Clearwater, and other northern Idaho streams are for about three-quarters of normal for the snowmelt season.

OREGON

The water supply outlook for Columbia River tributaries east of the Cascades, and south coastal streams is extremely poor except where reservoir storage is available to provide substantial additional water supplies. Irrigation reservoirs continue to gain storage from recent heavy rains and melting snow. Most lands without access to stored water supplies will experience an extreme shortage.

Snowpack has melted up to elevations as high as 7000 feet in some areas. The small gains in snowpack from the storm near the first of the month were wiped out by warm temperatures after the storm. If snowfall for the remainder of the season is average, the total seasonal accumulation will be about 50 percent of average.

Soil moisture conditions are generally good throughout the state. Storage in 24 of the principal irrigation reservoirs throughout the state is 78 percent of the 1943-57 average and 145 percent of February 1, 1962.

CALIFORNIA
CENTRAL VALLEY

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasts in California, reports that water supply conditions this coming spring and summer, based on February 1 data, will vary erratically in the various regions and localities of the state. Some streams of the Central Valley, for instance, are expected to have near normal streamflow for the water year as a whole, but may have late season (April to July) flows of only 50 percent of normal. Thus, for many areas, spring and summer supplies will be directly related to water in storage in reservoirs. Fortunately, reservoir storage is generally good (based on February 6 date), and agencies and individuals with access to stored water should have no great problems. However, there will probably be instances of agencies in adjacent areas which will suffer late season shortages because they must rely directly on the flow of a relatively less developed stream.

This water year in California started out quite well with record breaking rains in the northern portion of the state in early October. Very little precipitation was recorded during the following months, however, and concern for summer water supplies mounted as December passed and January wore on without the usual storms. The first rainfall of 1963 occurred on January 28 to terminate a record breaking 42-day period without significant precipitation. The late January storm was quite unusual; it was an extremely warm type with precipitation falling as rain as high as 8000 feet. The large amounts of precipitation falling on bare and frozen ground brought immediate and dramatic results. Resultant streamflow on all Central Valley streams was high, and the peak flow on the Yuba River into Narrows Dam exceeded the all-time record. Accordingly, many areas in California underwent a relatively quick change from potential drouth to a flood condition in a matter of days.

Snowpack is virtually nonexistent in the snow accumulation areas of the northern half of the state where elevations are generally lower, and even on the high ridges, only 15 percent of a normal April snowpack remains after the warm January rains. Conditions are slightly better in the southern Sierras where to date approximately 25 percent of the normal seasonal snowpack has accumulated. Normally, 50 to 60 percent of the seasonal snowpack has accumulated by February 1.

Although the recent unseasonal rain at high elevations has not permitted a normal snowpack to accumulate, it did result in some dramatic increases to reservoir storage. Many operators filled their reservoirs to flood control levels and significantly exceeded the storage quantities recorded on February 1 of last year. Storage in most of the reservoirs is above the past ten-year February 1 average. This condition will help many water users to begin planning tentative operating schedules for the coming spring and summer.

EXPLANATION of STREAMFLOW FORECASTS

1/ Observed flow adjusted for change in storage in Hebgen Lake. 2/ Observed flow adjusted for change in storage in Canyon Ferry and Tiber reservoirs. 3/ Observed flow adjusted for change in storage in Canyon Ferry, Tiber, Fort Peck, Buffalo Bill, and Boysen reservoirs. 4/ Observed flow adjusted for change in storage in Buffalo Bill Reservoir plus Heart Mt. Diversion. 5/ Observed flow minus diversion through Jones Pass Tunnel.

6/ Observed flow minus diversions from North Platte, Colorado and Laramie rivers plus measured diversions for irrigation and municipal use above station. 7/ Observed flow adjusted for change in storage in Clear Creek, Twin Lakes and Sugar Loaf reservoirs minus trans-mountain diversions through Busk-Ivanhoe and Twin Lakes Tunnels and Ewing, Fremont, Wurtz and Columbine Ditches. 8/ Observed flow adjusted for change in storage in Santa Maria, Rio Grande and Continental reservoirs. 9/ Observed flow adjusted for changes in storage in reservoirs listed in (8) plus Terrace, Sanchez, Platoro, and El Vado reservoirs. 10/ Observed flow adjusted for changes in storage in Granby Reservoir plus diversions through Adams Tunnel and Grand River Ditch.

11/ Observed flow adjusted for changes in storage in Flaming Gorge, Navajo, and Lake Powell. 12/ Observed flow plus diversion through Duchesne Tunnel. 13/ Observed flow adjusted for changes in storage in Flaming Gorge Reservoir. 14/ Observed flow adjusted for change in storage in Scofield Reservoir. 15/ Observed flow adjusted for change in storage in Navajo Reservoir.

16/ Observed flow adjusted for change in storage in Bear Lake Reservoir. 17/ Observed flow plus Utah Power and Light Tailrace and Logan, Hyde Park and Smithfield canals. 18/ Record computed by Bureau of Reclamation. 19/ Observed flow adjusted for change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake Aqueduct. 20/ Observed flow adjusted for change in storage in Otter Creek Reservoir.

21/ Observed flow adjusted for change in storage in Boca Reservoir but not Lake Tahoe. Forecast by Truckee Basin Water Committee. 22/ Observed flow adjusted for change in storage in Lake Chelan. 23/ Observed flow adjusted for change in storage in Flathead and Hungry Horse Reservoir. 24/ Observed flow adjusted for change in storage in any or all of the following reservoirs above the station: Kootenay Lake, Hungry Horse, Pend Oreille, Coeur d'Alene, F. D. Roosevelt, Lake Chelan, and Brownlee; and pumping to Banks Lake. 25/ Observed flow adjusted for change in storage in Coeur d'Alene Lake plus diversions to Spokane Valley Farms and Rathdrum Prairie Canals.

26/ Observed flow adjusted for change in storage in Mackay Reservoir plus diversion in Sharp Ditch. 27/ Combined flow of Big Wood near Belleview and Camas Creek near Blaine. 28/ Observed flow adjusted for changes in storage in Lucky Peak, Anderson Ranch and Arrowrock Reservoir. 29/ Observed flow adjusted for changes in storage in Cascade and Deadwood Reservoir. 30/ Observed flow adjusted for changes in storage in Palisades and Jackson reservoirs.

31/ Observed flow adjusted for changes in storage in Crane Prairie, Wickiup, and Crescent Lake reservoirs. 32/ Adjusted to natural flow. 33/ Observed flow adjusted for changes in storage in Lookout Point, Detroit, Cottage Grove, Dorena, and Hills Creek reservoirs. 34/ Observed flow adjusted for changes in storage in Keechelus, Kachess, Cle Elm, Bumping and Tieton reservoirs, plus diversions by Rosa, New Reservation, Old Reservation, and Sunnyside Canals. 35/ Flow records provided by COPCO and USBR.

36/ All forecasts are for unimpaired streamflow except Kaweah River. 37/ Not corrected for upstream impairments. All other forecasts are for observed flow.

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